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A Study on Linear Static Structural FEA of a Conveyor Stand for Different Stress Distribution and Shearing deformation

N.V Dhandapani[1], P Venkateshwaran[2*], J Ganesh Murali[1], V.S Thangarasu[3]

[1] Professor, Department of Mechanical Engineering, Karpagam College of Engineering. Coimbatore-641032

[2] Assistant Professor, Dept. of Automobile Engineering, Karpagam College of Engineering. Coimbatore-641032

[3] Professor, Dept. of Mech Engineering, Nehru Institute of Engineering & Technology. Coimbatore-641105

**Corresponding author E-Mail ID: venkateshwaran@kce.ac.in , Mobile: 9894238631*

ABSTRACT

The conveyor stand is to design and analysis for the various stress and deformation. Unpackaged material moving requirements have continued to press the strap conveyor industry to carry higher tonnages over longer distances and more diverse routes. In order to keep the material transport safe and short period of time, Conveyor have always been an efficient and elastic indentation due to idler support. To survive a support structure within the standard and recommendation the analysis carried out for various stress distribution and shearing deformation.

Key words: conveyor stand, design and analysis, FEA

1. INTRODUCTION

1.1 Geometry and Meshing

The provided CAD model is imported into ANSYS Mechanical for meshing (i.e., discretising into several smaller entities called elements) for the purpose of analysing by the Finite Element Method. The material is mild steel with yield strength of 210GPa [1-2].

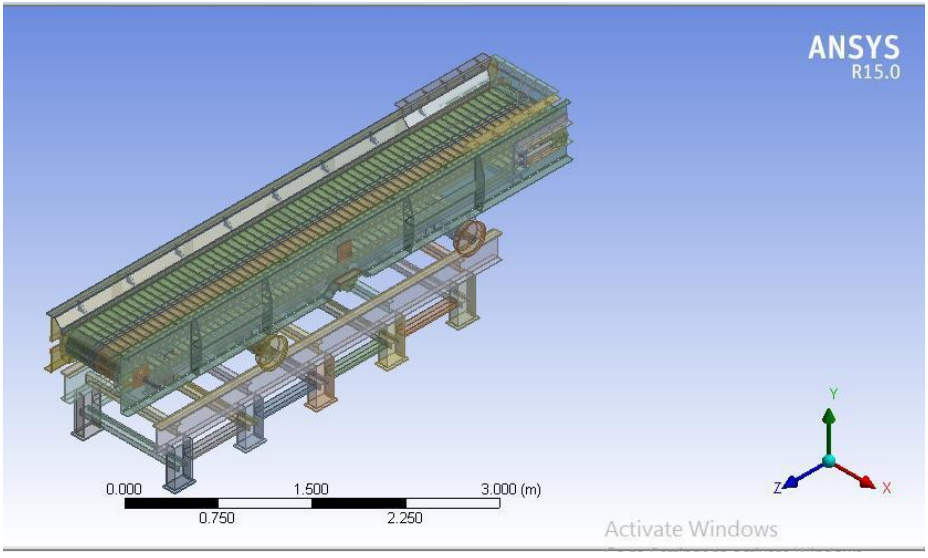

Fig.1

The geometry under consideration (supporting stand) alone is preserved and the conveyor structure is suppressed.

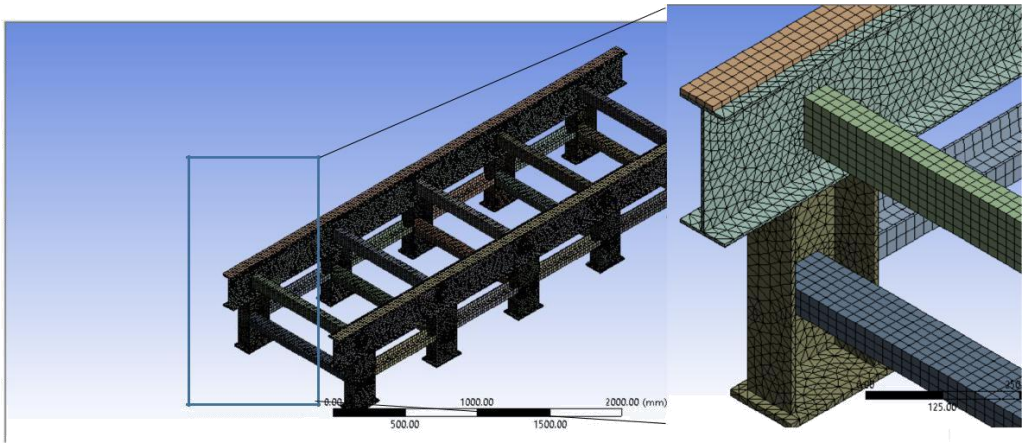

Fig.2

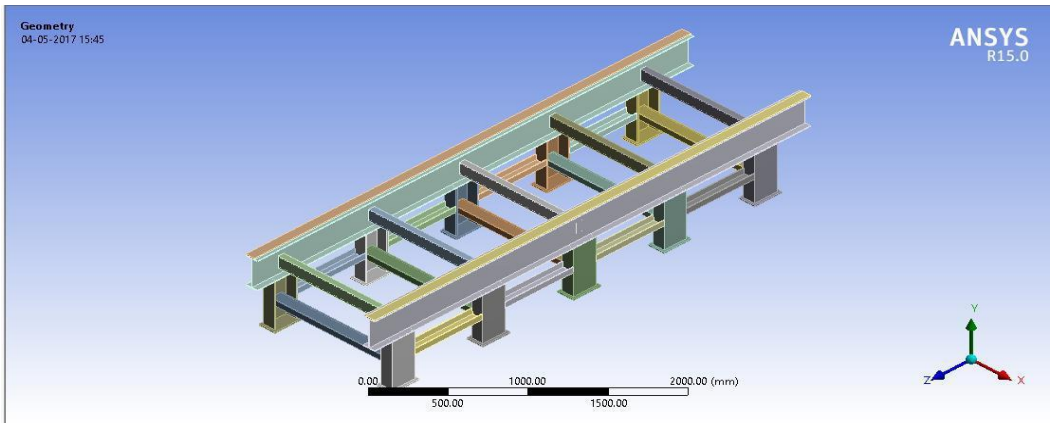

Fig.3

The figure below shows the meshed model generated using ANSYS. The entire structure is discretized into 4,69,676 number of four noded quadrilateral brick type elements.

1.2 Boundary Conditions

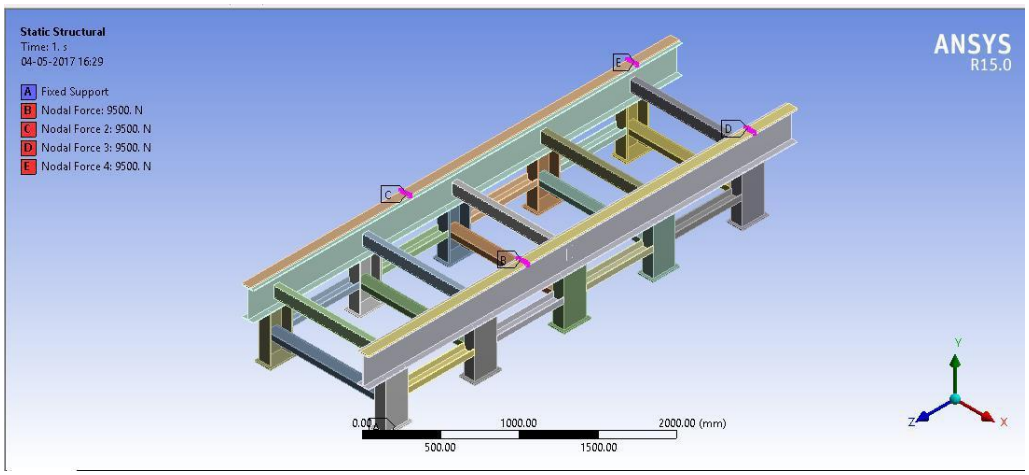

Fig.4

The bottom of the supporting legs are specified to be fixed supports, as they are rigidly fixed to ground. The weight of the conveyor assembly that is expected to be supported by the stand is specified to be 2000kg. A load of 500kg is carried by the conveyor. So, the weight that the stand has to carry is 2500kg. For analysis purpose, considering a safety margin, the loading condition is considered to be 1.5 times the actual load, i.e 3800kg [3-4].

The conveyor assembly is mounted on four wheels, resting on the I-beam surface of the stand. Hence, all the weight of the conveyor is transmitted to the stand via the wheels at 4 positions as line contact regions. The weight of 3800kg is applied as line loads on nodes on the surface of the stand that makes contact with the wheels as nodal force of 9500N per wheel [5-6].

3. RESULTS

3.1 Maximum equivalent (von Mises) Stress

The von-Mises stress induced in the structure is a maximum of 96 MPa. This is way less than the Young's modulus of 210GPa. Hence, the design is safe to withstand the required load.

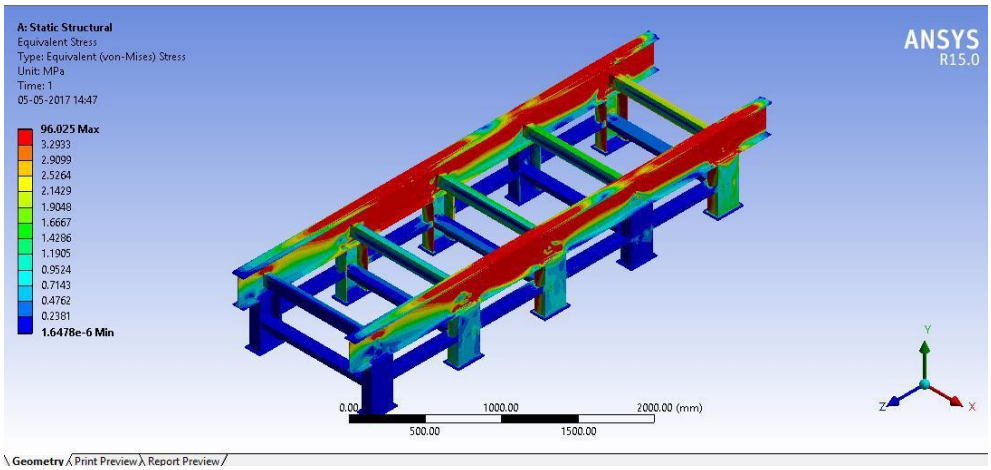

Fig.5

3.2 Total Deformation

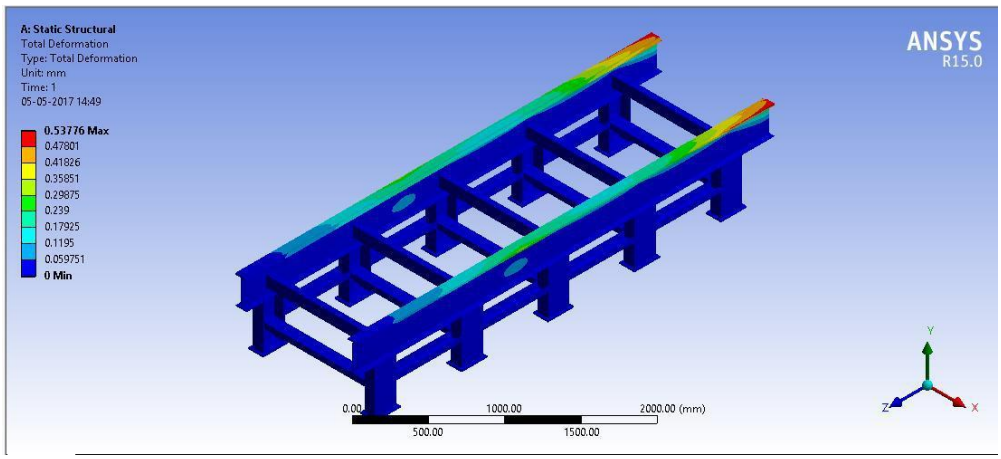

Fig.6

Deformation is under the applied load is observed to be 0.537mm

3.3 Maximum Shear Stress

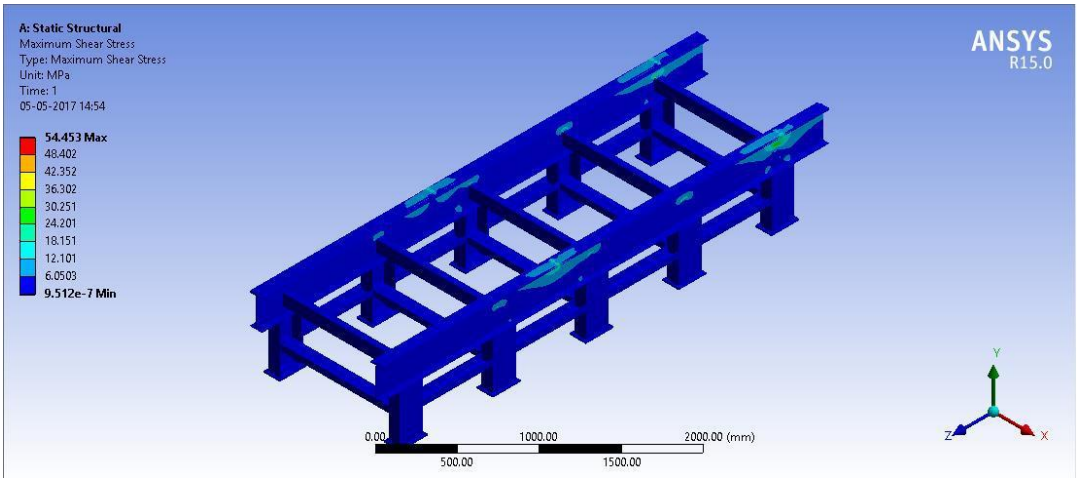

Fig.7

The maximum shear stress induced is 54 MPa.

4. CONCLUSION

The structural deformation and stress distribution is within standard and recommended values for deformation, von Mises stress and maximum shear stress. Hence, it is concluded that the design of the structure presented for analysis is safe to handle the loads under required performance criteria.

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